

Some Observations relating to the Function of Digestion. By A. P. W. Philip, M.D. F.R.S. L. & E. Read January 16, 1829. [*Phil. Trans.* 1829, p. 137.]

The author, referring to his former papers published in the Philosophical Transactions, concludes that digestion requires for its due performance, both a proper supply of gastric secretion, and a certain muscular action in the stomach; the latter circumstance being required for the expulsion of that portion of food which has been acted upon by the gastric juice. Nervous power is necessary for secretion; but the muscular action of the stomach being excited by the mechanical stimulus of the contents of that organ, is independent of the nervous power. It has already been shown by the author, that after the removal of a portion of the eighth pair of nerves, the galvanic influence directed through these nerves will restore the secretion of gastric juice; but Messrs. Breschet and Milne Edwards have lately endeavoured to prove, that the same effect results also from mechanical irritation of the lower portions of the divided nerves. The author points out several circumstances which appear to have been overlooked by these gentlemen, and which, he thinks, invalidate the conclusions they have deduced from their experiments. He states that a certain quantity of digested food will always be found in the stomach of the animal for five or six hours after the operation, and even after the lapse of ten or twelve hours, from its being less completely changed, and therefore expelled more slowly than in the natural state. The paper concludes with the recital of experiments made for the author by Mr. Cutler, in which the contents of the stomach of a rabbit, whose eighth pair of nerves, after excision, had been kept mechanically irritated, were compared with those of another rabbit, in which the nerves had not been irritated, and of a third, which had been left undisturbed. All those who witnessed the result of this experiment, among whom was Mr. Brodie, were convinced that the irritation of the nerves had no effect whatever in promoting the digestion of the food; neither did it at all contribute to relieve the difficulty of breathing, consequent upon the section of the nerves.

Experiments on the Friction and Abrasion of the Surfaces of Solids. By George Rennie, Esq. F.R.S. Read June 12, 1828. [*Phil. Trans.* 1829, p. 143.]

The first part of this paper is occupied by a rapid review of the labours of mechanicians on the subject of friction, from the period of those of Amontons at the end of the 17th century, to those of Coulomb and of Vince in the years 1779 and 1784; from which the author draws the conclusion that the progress of knowledge in this department of science has been slow and unsatisfactory, and that a wide field is still left open to experimental investigation. With a view to elucidate several points not yet sufficiently ascertained by

former writers, the author instituted several sets of experiments; some calculated to determine the forces required for dragging bodies of various kinds along a horizontal surface, and others for measuring the angle at which a plane was required to be inclined to the horizon in order to admit of the body sliding down it, attention being paid to the circumstances of pressure, extent of surface, time of previous contact, and velocity of motion.

The following are the principal conclusions which the author deduces from his experiments. The friction of ice rubbing upon ice diminishes with an increase of weight; but without observing any regular law of increase. When dry leather is made to move along a plate of cast iron, the resistance is but little influenced by the extent of surface. With fibrous substances, such as cloth, the friction diminishes by an increase of pressure, but is greatly increased by the surfaces remaining for a certain time in contact; it is greater, *ceteris paribus*, with fine, than with coarse cloths; the resistance is also much increased by an increase of surface. With regard to the friction of different woods against each other, great diversity and irregularity prevail in the results obtained; in general the soft woods give more resistance than the hard woods: thus, yellow deal affords the greatest, and red teak the least friction. The friction of different metals also varies principally according to their respective hardness; the soft metals producing greater friction under similar circumstances than those which are hard. Within the limits of abrasion, however, the amount of friction is nearly the same in all the metals, and may in general be estimated at one sixth of the pressure. The power which unguents have in diminishing friction, varies according to the kind of the fluidity of the particular unguent employed, and to the pressure applied.

The paper is accompanied with drawings of the apparatus used; and the details of the experiments are given at length in a tabular form.

An Attempt to rectify the Inaccuracy of some Logarithmic Formulæ.

By John Thomas Graves, of the Inner Temple, Esq. Communicated by John Frederick William Herschel, Esq. V.P. Read December 18, 1828. [*Phil. Trans.* 1829, p. 171.]

The discovery made by Poisson and Poinsoot during their recent researches on angular sections, of errors in trigonometrical formulæ usually deemed complete, drew the attention of the author to an analogous incorrectness in logarithmic series. He accordingly proposes in the present paper to exhibit in an amended form two fundamental developements; the principles employed in the establishment of which admit of application in expanding by different methods various similar functions, and tend also to elucidate other parts of the exponential theory.

He then enters into an analytical investigation of the equation $a^x = y$, and exhibits correct developements; first, of y in terms of